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ABSTRACT

A new project, designed by educators in Minnesota, will develop, evaluate, and disseminate model procedures for integrating new information and communications technologies into precollege instruction in rural areas. Consortia of small rural schools using interactive telecommunications will serve as pilot sites for developing and assessing the effectiveness of different models. A motor coach supplied with information and communications technology equipment will serve as a portable classroom and demonstration site. It will offer educators access to new technologies so that their value in achieving goals of instruction can be assessed. As a result, educators will be able to determine the purposes of instruction before deciding how recent and expected developments in information and communications technologies can be used to achieve curricular goals. A presentation is made of the premises, intended outcomes, decision making processes, and activities of a project to guide educators in determining the appropriate use of new information and communications technologies to achieve goals, enhance quality, and provide equal educational opportunity for precollege students in rural areas. (Author/JD)

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ENHANCING EDUCATIONAL OPPORTUNITY USING NEW TECHNOLOGY

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ENHANCING EDUCATIONAL OPPORTUNITY USING NEW TECHNOLOGY

Educators face a dilemma, should they purchase computer and telecommunications equipment and then determine uses for it, or plan applications of these technologies and then decide what, if any, equipment to purchase? On the surface this does not appear to be a dilemma at all - of course one should plan before acting. But the realities of rapidly changing technological developments, pressures from various interest groups, financial opportunities, and felt needs to 'remain current' lead educators to make equipment purchase decisions before their potential use and value are determined.

This dilemma is not easily resolved by educators. They seem to have little opportunity to carefully study technological developments, reflect on purposes and strategies of instruction, and to create appropriate uses of technology to best achieve defined instructional purposes. The project described in this paper will develop ways of resolving this dilemma while improving instruction in rural schools through cost effective applications of new information and communications technologies.

The project, which is just beginning, is designed to increase educational opportunities for young people and adults in rural communities by assuring appropriate use of new technologies. Its two phases offer a comprehensive plan to ensure that curricular and instructional decisions associated with use of new information and communications technologies will result in an improved quality of instruction. Phase one will: 1) develop and disseminate cost effective model procedures for integrating technology into instruction, and 2) evaluate the effectiveness of using new technologies to improve precollege instruction. School building level, district, and community based decision making and the formation of linkages among individuals and agencies within and beyond the state of Minnesota form the base on which project goals will be achieved.

Phase two will build on the knowledge and experience gained in phase one to: 1) develop interactive telecommunication links among individuals and agencies in the rural and urban areas of Minnesota, and 2) create a computer data base of resources for using new technologies in instruction.

PLANNING

The project began when faculty from the University of Minnesota, Morris met with School district superintendents in west central Minnesota to determine ways of effectively utilizing the telecommunications equipment being installed to link area schools together. It was soon apparent that the issues involved in implementing this new technology went far beyond the technical considerations that were the initial focus of attention. As

discussions continued it was determined that a major project to determine how to effectively integrate new technological developments into instruction was needed. The result is the project described here.

Initially, the active participation of 40 people was sought to form a planning team. These individuals represented K-12 teachers and administrators in 16 school districts, two regional educational cooperative service units, Minnesota State Legislature, State Department of Education, State Planning Agency, Minnesota Alliance for Science, Science Museum of Minnesota, Minnesota Public Television, WETA in Washington, D.C., St. Paul Cable Systems Office, and University of Minnesota graduate and undergraduate colleges and Office of Continuing Education. They were supported by a grant from nine school districts in west central Minnesota with enrollments of 233 to 1101 for an average of 371 students per school district.

These individuals and agencies joined together because of the opportunity that exists in Minnesota to develop and experiment with instructional applications of new technology for the improvement of precollege education. According to the Commissioner of Education, "Minnesota has more technology in the schools than any other state." Further, many small communities are investing in interactive telecommunications equipment, satellite receivers, computers, and interactive laser disc systems to ensure that their schools and communities will remain viable and have equal access to educational opportunities.

OBSERVATIONS: Discussions among members of the planning team, in both formal and informal settings, reaffirmed findings of professionals involved in evaluating the implementation of new technologies in schools in Minnesota. The work of Diane L. Morehouse of Quality Education and Development in Menomonie, Wisconsin was, and is, particularly relevant to the development of this project. She frequently finds herself, "consulting with school districts who believe they NEED technology; however, they seldom seem to know WHY or HOW technology fits into a comprehensive school improvement process". She, like all other people involved in this project, concludes that comprehensive planning for the use of technology in instruction is essential.

Through her experience evaluating instructional applications of technology for the Minnesota State Department of Education and on behalf of local school districts Ms. Morehouse has determined that:

1. The human resource issues have been more serious than the technological issues. The technology, when carefully planned and implemented, works remarkably well. Planning, preparation, communication among participants, cooperation and other human relations are more troublesome.

2. The leadership exercised by program staff is more crucial to the successful use of high technology, particularly telecommunications technology, than the amount or the sophistication of the hardware. Simply stated, the money and the type of technology matters less in terms of successful operations than the people involved in a given program.

3. Telecommunications (and other technologies) will require a long time to be fully integrated into instruction. There appears to be something analagous to a learning curve operating, with the first stage involving motivation and readiness; and subsequent stages requiring training and experience for staff and learning and experience for students.

4. Technology seems to breed itself. Each purchase and each use seems to create additional demand for hardware and software. Many of the people involved say the schools have no choice but to provide students with high technology because the world will demand they be competent in its use. If this is true, questions of cost may not be entirely relevant.

5. There seem to be two major aspects to the use of technology in instruction. The first is to provide students with some knowledge about technology as a life skill, i.e., using technology to teach about technology. The second is to use technology as an instructional tool, i.e., using technology to impart knowledge. Both appear to be necessary.

6. Software remains a problem; good software is scarce, often expensive, and sometimes difficult to coordinate with text and curriculum.

7. As technology enters the schools, a kind of "catch-up" process has to occur. For example, in many places, computer literacy is being written into elementary curricula and students are acquiring such skills as keyboarding rapidly. However, high school students will also need such skills, particularly as colleges and universities begin to require knowledge of word processing. This may produce a kind of discontinuity in curriculum until elementary students reach high school. Ultimately keyboarding and beginning programming classes may not be needed in secondary curriculum.

8. The widespread use of technology raises some questions of equity, as boys continue to outnumber girls in technology-related courses, and as students whose families own computers are placed in competition with students who cannot afford a computer. Other equity questions can be raised about students attending schools where significant investment has been made in technology vis a vis those coming from less fortunate backgrounds.

9. There is little indication that technology has produced a rapid proliferation of new courses; rather, technology offers teachers and students a wider array of options within existing curricula.

10. The most successful applications of technology are those where concrete, specific, doable plans have been developed. Plans must first take into consideration the instructional and organizational needs the system is intended to serve. Technological planning is secondary in importance.

In more direct reference to the implementation of interactive telecommunications systems she concludes that:

1. Interactive television can be somewhat dysfunctional; good televised teaching requires preparation, alterations in teaching style and methodology and better use of available instructional aids. Participants must be given adequate time and adequate feedback first to feel comfortable with systems and second to successfully adapt to them.

2. Students adapt quickly and well to interactive television:

   a. learning appears to be about the same as in more traditional environments;

   b. discipline problems have been non-existent - in part because television itself appears to have some self-policing effects, in part because virtually all classes with which we've had experience have been low incidence electives for which students are more highly motivated;

   c. there are indications that active questioning behavior is inhibited, particularly in the absence of careful instruction.

3. System costs have been high. Given the level of necessary expenditure, careful planning is mandatory. Careful planning can promote the wiser use of existing resources and allow consortia to capitalize on cooperative cost-sharing with business and industry and on non-traditional revenue sources.

4. Teachers must have knowledge of and experience in telecommunications technology before it can be used effectively with students. Moreover, to avoid subsequent problems, it is essential to involve teachers in planning and decision-making for interactive systems.

Finally, and obviously, evaluation at several levels appears to be essential. External, independent evaluation has been essential in fundraising and accountability; internal (formative) evaluation has been extremely helpful in preventing major operating problems.

PREMISES: Consistent with the observations of Ms. Morehouse, and as a result of practical experience with technology and change processes in education, the 40 people planning this project agreed upon a number of premises to guide project activities. They believe that the project must:

1. lead to development of long range plans that are cost effective and have lasting impact;
2. form linkages among individuals and agencies that support teacher and school level decision making;
3. foster decision making, problem solving, and the development of skills and understandings needed by citizens in an information society;
4. help teachers develop a greater sense of professionalism and offer them tangible rewards;
5. facilitate decision making and help school administrators implement plans that are developed through cooperative efforts;
6. begin with a few districts where a significant commitment has been made by the school board and educators to the use of technology in instruction, and then expand services to other schools as concepts are developed and resources allow;
7. adapt to and complement other priorities and commitments of the teachers and districts it is serving;
8. use consultants and teachers in the schools rather than a large central staff to accomplish its purposes.

RATIONALE

CHOOSING TECHNOLOGY: The appropriate choice of technology for each task is an issue facing people in all parts of the world. In northern Nigeria the centuries old shaduf is used to draw water from streams to irrigate productive farm land while nearby, multi-million dollar irrigation projects have uprooted whole villages and covered prime agricultural land. Meanwhile a simple, maintenance free well that assures rural villages of a clean and constant source of water has recently been developed and put to use in Zimbabwe. In education, India has long made effective use of radio for instruction and China is using television for the same purpose. Nonetheless, the primary tools of instruction in the world today continue to be chalk; chalkboard; pencil; paper; textbook; and caring, capable educators. In these, and many other situations, making the correct choice of technology to use for each problem is important and has far reaching effects.

In the United States, equipment using new technological developments is regularly purchased by educators in local schools with the intent of improving instruction. Only rarely are these decisions made after careful study of the equipment and its ability to fulfill clearly stated curricular and instructional purposes. The result is the purchase of equipment that is inappropriate for the intended purpose and setting in which it was to be used. In the end the equipment is not used and is soon found in a storeroom.

As in the developing world, educators in the U.S.A. must determine the appropriate use of technology to solve the problems they face. For example, in education the issue of appropriate use of technology is central to the debate over whether, or at what point, students should be allowed to use pocket calculators in their coursework. When is it appropriate? This depends on the purposes of instruction which are defined. In the U.S.A., albeit with outside influence, these purposes are ultimately determined by educators in the local schools. It is at this level of decision making that any attempt to integrate technology effectively into instruction must begin.

EDUCATION IN MINNESOTA: Minnesota has a long history of commitment to quality education and educational opportunity for all its citizens. Minnesota has the highest percentage of young people in the U.S. graduating from high school (86%). Eighty-eight percent of these graduates continue their education beyond high school through vocational (30.5%), two-year degree (10.4%), four-year degree (34.3%), masters degree (7.3%), and professional degree (5.4%) programs. With 27 institutions of higher education; the largest urban campus in the U.S.; and a number of high quality undergraduate, small, private, and public liberal arts colleges Minnesota continues to demonstrate its commitment to educational opportunity and excellence.

Educators in Minnesota have extensive experience with applications of information and communications technologies in instruction. For example, the Minnesota Education Computing Consortium (MECC) has been a leader in developing applications of computers in instruction. Initially students in all parts of the state used remote access terminals to communicate with a single mainframe computer. With the advent of the micro computer MECC supported its use in schools and created a large library of micro-based instructional programs. Beginning in 1980 the first use of low power television to deliver instruction among students in small rural schools in Minnesota was begun. Now, over 50 school districts in groups of five to ten, either have, or are in the process of installing, two way interactive telecommunications systems for the purpose of sharing instructional resources to increase opportunity and enhance the quality of instruction for young people.

In a comprehensive study of mathematics and science instruction in Minnesota, The Minnesota Alliance for Science discovered reason to be concerned about the teachers of these subjects. They found that the average age of these teachers is 44.3 years. Thus, most of them received their educational training 20 or more years ago and will be retiring by the year 2000. They found that these teachers feel devalued by the people they serve and, especially in rural areas, feel isolated from other colleagues and professionals in business, industry, and post-secondary institutions. They learned that elementary teachers frequently teach less science

than is recommended due to lack of materials and/or a sense of inadequate preparation and that teachers, particularly in rural areas, have few opportunities to improve their skills. As one example, only 17 percent of all teachers in rural areas have a masters degree compared with 36 percent of all teachers in the metropolitan areas of the state who have masters degrees. While there is reason to be pleased with many past successes, there is greater reason to be concerned with how both equality of opportunity and quality of instruction will be maintained in the future.

SMALL SCHOOLS: One-half of the school districts in Minnesota graduate 50 or fewer students each year. They are typically in rural areas of the state and have long played a significant role in preparing well educated citizens who live in and beyond the borders of the state. As is happening across the nation, these schools are facing declining enrollment. For example, one region of the state that this project will serve is expected to have a 27 percent decline in the number of its graduating seniors by 1990 followed by partial growth to the year 2000. This means the region will have fewer resources to deliver the quality and scope of education needed and expected by today's young people.

Shrinking enrollments and resources, while important to all schools, are particularly devastating in rural communities. In most of these communities the decline of the school has a direct, negative effect on the social and economic health of the whole community. In some cases, the loss of a school results in the eventual death of the community. This fact, coupled with a firm belief of the citizenry in the value of local control of education, places a major burden on educators in these communities. They are facing a current and developing dilemma: how do they improve the quality and expand the scope of their programs let alone maintain current programs with fewer resources.

To improve programs using limited resources, educators in Minnesota are turning to inter-district cooperation, interactive telecommunications, and other technologies for solutions. They are building on a long history of cooperative ventures among school districts. These relationships are now expanding to include corporate and private as well as public institutions. The Educational Cooperative Service Units (ECSU) are one example of inter-district cooperation. In 1976, after several attempts to coordinate cooperative efforts among school districts, the state legislature established nine ECSUs to serve all school districts in the state. Their charge was to "provide educational planning on a regional basis and assist in meeting specific educational needs of children in participating school districts which could be better provided by an ECSU than the districts themselves." A newer, and developing relationship among districts centers on the use of interactive telecommunications. Currently, well over 50 school districts are involved in groups of four to nine districts to implement interactive telecommunications systems to enhance instructional opportunities for their students.

DECISIONS: Which sequence of decisions is best? 1) Deciding what new technology to purchase for instruction followed by deciding how to use it, or 2) Determining the goals and best approach to instruction followed by selection and/or development of suitable technology? In our current period of rapid technological development this is a difficult choice to make, much like trying to determine which should come first, the chicken or the egg. The choice of sequence is important and significantly affects the efforts of educators and the public to keep education ahead of, or at least current with, changes in our society.

Commonly, decisions about the use of new technology in instruction have centered on determining how to use equipment that has already been purchased. It is far rarer to find situations where the purposes and procedures of instruction have been clearly defined and then used to guide analysis and selection of technological tools. As experience with technology in schools has grown educators are becoming increasingly aware of the need to understand first what they are trying to accomplish before they determine how the technology should be designed to meet those needs.

Defining the goals and needs of education and then selecting or designing technological tools that will assist in achieving those ends is a complex task. It requires the participation of individuals with different perspectives on the nature of education and the future of society. It requires an understanding of both the potentials and limitations of various technologies in the delivery of instruction. And it requires time, consensus building, and development of commitment to integrate technological changes into the fabric of the educational process. This project will develop and test models for completing this task. It will offer educators examples of effective use of new technologies to increase educational opportunity and improve quality.

OPPORTUNITY: Minnesotans have made significant commitments to the use of technology in education as exemplified by the nationally recognized Minnesota Education Computing Consortium and the extensive investment in computers for the schools. Recently, small schools have also made large investments in interactive telecommunications systems. For example, the pilot schools for this project have invested over $700,000 in interactive telecommunications equipment and the state legislature has disbursed another $750,000 to help equip other telecommunications clusters in the state. This is a small portion of the total investment in telecommunications equipment by over ten clusters of small schools in Minnesota. These are important investments that have prepared the way for improving the opportunity for, and quality of instruction in the state.

A lot of planning has gone into the engineering and technical aspects of installing this telecommunications equipment. Very little planning has gone into determining how to make effective

use of it. There is a deeply held belief that interactive telecommunications is the best way to solve a number of current problems and to enhance instruction. But, there has been little demonstration or evidence that it will do so. Issues including teacher training, curriculum development, special programming, adult education, and appropriateness for different audiences have had little consideration and remain undeveloped. These issues are of great concern to the schools that have invested in this technology. Educators in these schools want to work with others to learn how to use their investment effectively for the benefit of all students. Thus this project will take advantage of the investment these schools have made to learn how to make effective use of new technologies for the benefit of students throughout the state and nation. And given the nature of new technology these lessons can also be used by educators in many developed and developing parts of the world.

GOALS

The needs associated with the use of technology in education have changed. Ten years ago this project probably would have emphasized the purchase of computers or other hardware. Today educators are less concerned with the mere purchase of equipment. They are more concerned about the appropriate use of technology and the process through which it is integrated into instruction. This project reflects that change and uses the cooperative effort of a number of agencies and institutions in Minnesota to develop and test alternative ways of integrating technology into instruction.

This project will enhance precollege instruction through appropriate use of new technologies. It will develop model ways of determining the appropriate use of technology for different settings, assist in improving both quality and opportunity in education, build on cooperative ventures to maintain small school and community viability, determine purposes of instruction that guide use of technology, and use the investment in technology of Minnesota schools for the benefit of educators and young people in this country and potentially the world. It uses local decision making and the development of linkages among individuals and agencies in the public and private sectors of our society to achieve its goals.

Two goals and their related objectives guide the phase one sequence of activities. They are interdependent components that together will allow the full consideration of the complex and intertwined issues associated with implementation of new technologies.

I. Guide educators and community members in determining appropriate uses of new technology to improve quality, enhance opportunity, and more effectively achieve the purposes of precollege instruction.

1. Establish demonstration centers where alternative approaches to the integration of technology in instruction are tested.

2. Provide opportunities for present and future teachers to develop skills and understandings that will lead to improved instructional effectiveness.

3. Implement models of K-12 articulated curricula in which instruction has been improved using technology.

II. Determine the value and impact of new technologies in achieving the purposes of precollege instruction.

1. Assess the impact of different uses of information and communications technologies on learning, on educators, and on the community.

2. Determine the merits of different approaches to the integration of technology in instruction.

Phase two of this project will build on the foundation developed in phase one. It will, therefore, be developed in greater detail later. Phase two will expand the scope of dissemination activities initiated in phase one and achieve two new goals.

I. Develop interactive telecommunications programming that brings resources in rural and urban areas of Minnesota together for the enhancement of precollege instruction in all schools.

1. Form linkages among individuals and agencies in Minnesota to share resources with young people through interactive telecommunications.

2. Develop and test an interdisciplinary curriculum on Minnesota issues that brings urban and rural perspectives and resources together through interactive telecommunications.

II. Develop a nationally accessible computer data base of state, national, and international resources for instruction using communication technologies.

ACTIVITIES

PHASE ONE: The following activities have been developed to achieve the two goals and related objectives of phase one.

GOAL I: APPROPRIATE USE OF TECHNOLOGY IN INSTRUCTION. This is the central goal of the project. It is based on involving educators in rural school districts and representatives of private and public sector agencies in cooperative decision making. The activities will result in development of model procedures for integrating technology into instruction that can be replicated by other school districts at minimal cost.

This goal will be accomplished by:

1. Developing alternative models for integrating technology into instruction. They will include, in part, a self sustaining planning process based on institutional assessment, goal setting, and implementation that will guide continual renewal of district and regional programs.

2. Testing the models with groups of school districts that are at different stages in the use of technology.

3. Contracting services with school boards to assure district support of teacher and community efforts to improve instruction. The project will integrate its efforts with other initiatives already undertaken by each school.

4. Guiding teacher based development of K-12 scope and sequence curricula that makes more effective use of the time currently available in the school day. Guidelines published by the national organization for each discipline, along with selection and adaptation of available materials, will focus these efforts.

5. Offering preservice and long term inservice training for educators on developments in the disciplines and ways of using technology to enhance instruction in each discipline.

6. Developing and offering a Masters of Education degree that meets needs of secondary school teachers in rural schools. Participation in this project will partially fulfill requirements for the degree. Other requirements will be completed through use of interactive telecommunications and other ways of bringing instruction to the teachers.

7. Creating links between university faculty and precollege teachers to improve both the content and process of instruction at both levels. And, when appropriate, using new technology to facilitate an on-going dialogue.

8. Developing a motor coach for demonstrating instructional uses of interactive telecommunications, computers, interactive laser disc, and other new technologies in rural schools and communities. The coach will be similar to a bookmobile, but will not loan out the equipment installed in it. It will be used by project staff to assist teachers, students, and community leaders in selecting and making effective use of equipment that is appropriate for their situation.

9. Introducing parents and other community members to new technologies being used in the schools and assisting them in exploring ways of using them to meet other needs in the community.

10. Disseminating results of this project to other schools in and beyond Minnesota.

GOAL II: EVALUATION. It is both unrealistic and uninformed to implement processes for integrating new technologies into instruction without assessing progress, correcting errors, and determining merit. Completion of this goal will help assure that model development, training, and dissemination activities are monitored, problem areas identified and corrected, successful procedures repeated, and that the effects of technology on teaching and learning are understood and communicated to others. The evaluation process will proceed from a formative mode to comparative assessment of program models and their effects. Educators in local schools will be involved in creating the evaluation design, in data collection and analysis, and in reporting findings.

This goal will be accomplished by:

1. Contracting with an evaluation specialist to develop short and long range evaluation plans that will be revised through on-going discussion with project staff and evaluation audiences to reflect changes in the project.

2. Training project staff and precollege educators in evaluation methods to facilitate formative and summative project evaluation.

3. Employing a variety of methods to assess the various stages of the project: interviews, questionnaires and attitude measures to assess reactions to training and dissemination processes; case studies supplemented by interviews, document reviews and content analyses of curriculum materials to describe and document program implementation; and both expert judgment and quasi-experimental approaches to assess the quality and effectiveness of instructional models.

4. Gathering and disseminating information that helps educators and developers of educational applications of technology to create and implement useful models and techniques.

PHASE TWO: Activities associated with goals in phase two of this project include:

GOAL I: URBAN - RURAL LINK. Many resources to enhance instruction exist in the rural areas of Minnesota. Many others exist in the urban areas. But these are not accessible by residents in both areas. The activities associated with this goal take advantage of a little used interactive microwave link between Minneapolis and St. Paul and the western, northeastern, and southwestern regions of the state. It was initially constructed to deliver programming to Public Broadcasting stations around the state which is now being delivered through satellite transmission.

The link is being extended to allow for interactive programming among individuals and agencies in the state. In western Minnesota it is being extended from the Public Broadcasting station to the University of Minnesota, Morris, and from there to school districts through Instructional Television Fixed Service (ITFS) systems in the region. In St. Paul, temporary microwave links must be used to connect agencies such as the Science Museum of Minnesota and government offices, including the state legislature, with communities in western Minnesota. It is expected that these temporary links will be replaced by a permanent system in the near future.

By using this system to enhance instruction, educators will have the opportunity to involve students in live, interactive meetings with individuals around the state. Initial programming will be built around an activity of the Science Museum. The Museum is developing an Issues Gallery that will focus attention on issues of particular concern to Minnesotans. The issues will change periodically to reflect changes in events and interests. They will be built into an interdisciplinary study program that uses interactive telecommunications to expand student access to resources about the issue. For example, rural students will be able to study the issue in their school and community, and then interact with individuals who are 150 to 200 miles away without leaving their school. They will use the interactive system to talk with Science Museum staff and tour the Issues Gallery. At another point in their study they can discuss the issue with representatives of concerned interest groups and members of the legislature. Finally, some students may even testify at a legislative hearing on the issue.

During phase two this goal will be accomplished by:

1. Preparing a model for an instructional guide for teachers and students on current issues in Minnesota (e.g. solid and hazardous waste management). The model will take as its theme the development of problem solving and decision making skills through study of the issues.

2. Preparing the first instructional guide on an issue. This guide will be revised as the issue in the Gallery changes, approximately every six months.

3. Arranging for programming from the Science Museum, Legislature, and other individuals and agencies.

4. Selecting three rural schools where this interdisciplinary study program will be pilot tested.

5. Testing and revising the materials followed by their use in more rural schools.

6. Developing programming that presents rural perspectives on the current issue in the Gallery.

7. Selecting three urban/suburban schools to pilot test the materials. Students in these schools will participate in the same programming as rural students. They will also interact with individuals in the rural areas who are concerned about the same issue. Finally, students in urban and rural areas will discuss their findings with each other.

8. Testing and revising the materials and strategies followed by extension of the program to other schools in the state.

9. Disseminating results to other regions of the U.S. where similar programs could be implemented.

GOAL II: COMPUTER DATA BASE. A cross referenced computer data bank of instructional resources using communications technology will be developed. This will, initially, serve as a center for collecting information on activities by individuals and agencies in Minnesota. In future years it will be expanded to include national and international resources. Accomplishing this goal will assist in forming links among agencies and individuals and help ensure the use of past experiences in the development and implementation of new programs using new technologies.

Everyone involved in this project has experienced the situation where they learned, too late, that someone nearby was working on a project related to their own interests and needs. This has resulted in duplication of effort and unnecessarily limited impact of people's efforts. To plan effectively and make use of developments in the application of technology it is critical that educators have access to information about them. Equally, to accomplish successfully the other goals of this project, all participants need a means of learning about the ideas other people are working on. Word of mouth communication is too limited for the rate and scale of change being undertaken.

During phase two this goal will be accomplished by:

1. Preparing criteria for selection of materials and information to be included in the data bank. Information on educational developments and projects in telecommunications, interactive laser disc, and computers as they relate to communications technology will be included.

2. Creating a system for indexing materials and information to be included in the data bank.

3. Creating, or selecting and adapting, a data base management system (e.g. System 2000) for storage and retrieval of information.

4. Using an electronic mail facility for searching the data base and sharing current information with others.

5. Collecting, indexing, and entering information into the data base. The ongoing process of entering and editing data in the computer will eventually be supported by other agencies.

6. Testing the operation of the system and using it to complete goals of this project.

7. Advertising availability of the data base and electronic mail system for use by educators and others in and beyond Minnesota.